

CLAIMS

1. An article coated with a functional coating film which comprises a base material, a primer layer which coats a surface of the base material and has fine roughness and a functional layer coating the primer layer, wherein the primer layer having fine roughness has portions formed by unevenly accumulating fine particles.
2. An article coated with a functional coating film according to Claim 1, wherein the primer layer comprises silicon oxide as a main component.
3. An article coated with a functional coating film according to any one of Claims 1 and 2, wherein an average thickness (H) of the functional coating film comprising the primer layer and the functional layer is 30 nm or greater and 200 nm or smaller, and a difference between a maximum height of profile (Ry) on a surface and the average thickness (H) of the functional coating film is 50 nm or greater.
4. An article coated with a functional coating film according to Claim 1, wherein a diameter of the fine particles is 5 to 100 nm.
5. An article coated with a functional coating film according to Claim 1, wherein a surface roughness of the functional coating film comprising the primer layer and the functional layer is at least 10 nm expressed as an arithmetical mean deviation of the assessed profile (Ra), and a haze value of the functional coating film is 1% or smaller.

6. An article coated with a functional coating film according to Claim 1, wherein the functional layer is a water repellent coating film or an antifouling coating film.

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7. An article coated with a functional coating film according to Claim 6, wherein the water repellent coating film is an organic coating film having at least one of fluoroalkyl groups and alkyl groups.

10 8. An article coated with a functional coating film according to Claim 7, wherein the alkyl group includes at least one group selected from octyl group, decyl group and dodecyl group.

15 9. An article coated with a functional coating film according to Claim 6, wherein a contact angle of water with the water repellent coating film measured by placing 2 mg of a water droplet on a surface of the water repellent coating film is at least 145 degrees.

20 10. An article coated with a functional coating film according to Claim 6, wherein the antifouling coating film is an organic coating film having a polyalkyleneoxyl group.

25 11. An article coated with a functional coating film according to Claim 1, wherein the base material is a material selected from transparent glass plates, resin plates and resin films.

12. A coating material for forming a functional coating film which is a coating material for forming a primer layer which comprises silicon oxide as a main component and has portions formed by unevenly accumulating fine particles of silicon oxide and a functional layer on the formed primer 5 layer, the coating material comprising a fluid containing the fine particles of silicon oxide and a fluid for forming the functional layer in combination.
13. A coating material for forming a functional coating film which is a coating material for forming a primer layer which comprises silicon oxide 10 as a main component and has portions formed by unevenly accumulating fine particles of silicon oxide and a functional layer on the formed primer layer, the coating material comprising a fluid containing the fine particles of silicon oxide and a functional material.
- 15 14. A coating material for forming a functional coating film according to any one of Claims 12 and 13, wherein the fine particles of silicon oxide comprise fine particles having shapes formed by three dimensional bonding, and a solvent of the fluid containing the fine particles of silicon oxide or a solvent of the fluid containing the fine particles of silicon oxide 20 and a functional material is a solvent which can disperse the fine particles of silicon oxide.
15. A coating material for forming a functional coating film according to Claim 14, wherein the fine particles of silicon oxide comprise fine particles 25 having shapes formed by three dimensional bonding of spherical fine particles having a diameter of 5 to 100 nm to each other over a length of

30 to 300 nm.

16. A coating material for forming a functional coating film according to Claim 15, wherein the fine particles of silicon oxide comprise fine particles having shapes formed by cyclic bonding of the spherical fine particles to each other.
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17. A coating material for forming a functional coating film according to any one of Claims 12 and 13, wherein the fine particles of silicon oxide comprise fine particles having shapes formed by one dimensional to three dimensional bonding, and a solvent of the fluid containing the fine particles of silicon oxide or a solvent of the fluid containing the fine particles of silicon oxide and a functional material is a mixed solvent comprising a solvent which can disperse the fine particles of silicon oxide and a solvent which cannot disperse the fine particles of silicon oxide.
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18. A coating material for forming a functional coating film according to Claim 17, wherein the fine particles of silicon oxide comprise fine particles having shapes formed by one dimensional to three dimensional bonding of spherical fine particles having a diameter of 5 to 100 nm to each other over a length of 30 to 300 nm.
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19. A coating material for forming a functional coating film according to Claim 18, wherein the fine particles of silicon oxide comprise fine particles having shapes formed by linear and/or cyclic bonding of the spherical fine particles to each other.
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20. A coating material for forming a functional coating film according to any one of Claims 14 and 17, wherein the solvent which can disperse the fine particles of silicon oxide comprises a hydrophilic solvent.

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21. A coating material for forming a functional coating film according to Claim 20, wherein the hydrophilic solvent is an alcohol-based solvent.

22. A coating material for forming a functional coating film according to
10 Claim 17, wherein the solvent which cannot disperse the fine particles of silicon oxide is a nonaqueous solvent.

23. A coating material for forming a functional coating film according to
Claim 22, wherein the nonaqueous solvent is at least one of hydrocarbon
15 solvents and silicone-based solvents.

24. A coating material for forming a functional coating film according to
Claim 17, wherein, in the mixed solvent, the solvent which can disperse
the fine particles of silicon oxide is more volatile than the solvent which
20 cannot disperse the fine particles of silicon oxide.

25. A coating material for forming a functional coating film according to
any one of Claims 12 and 13, wherein at least one of metal compounds and
water glass is added to the fluid containing the fine particles of silicon
oxide or the fluid containing the fine particle of silicon oxide and a
functional material.
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26. A coating material for forming a functional coating film according to
Claim 13, wherein the fluid containing the fine particle of silicon oxide
and a functional material comprises 0.01 to 3% by mass of water and
5 0.00001 to 0.1% by mass of a catalyst.
27. A coating material for forming a functional coating film according to
any one of Claims 12 and 13, wherein the functional layer is a water
repellent coating film or an antifouling coating film.
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28. A coating material for forming a functional coating film according to
Claim 27, wherein the water repellent coating film is an organic coating
film having at least one of fluoroalkyl groups and alkyl groups.
- 15 29. A coating material for forming a functional coating film according to
Claim 28, wherein the alkyl groups include at least one group selected
from octyl group, decyl group and dodecyl group.
30. A process for producing an article coated with a functional coating
20 film which comprises a base material, a primer layer which coats a
surface of the base material and has fine roughness and a functional layer
coating the primer layer, the process comprising steps of coating the
surface of the base material with a fluid containing fine particles of silicon
oxide, forming the primer layer having fine roughness by unevenly
25 accumulating the fine particles of silicon oxide on the surface of the base
material, and coating the formed primer layer with a fluid for forming the

functional layer.

31. A process for producing an article coated with a functional coating film according to Claim 30, wherein, after the surface of the base material
5 is coated with the fluid containing the fine particles of silicon oxide, the fluid coating the surface of the base material is air dried at an ordinary temperature.
 32. A process for producing an article coated with a functional coating film according to Claim 30, wherein the fine particles of silicon oxide
10 comprise fine particles having shapes formed by one dimensional to three dimensional bonding, a solvent of the fluid containing the fine particles of silicon oxide is a mixed solvent comprising a solvent which can disperse the fine particles of silicon oxide and a solvent which cannot disperse the
15 fine particles of silicon oxide, and, in the step of coating the surface of the base material with a fluid containing the fine particles of silicon oxide, the surface of the base material is kept wet with the fluid containing the fine particles of silicon oxide until at least the solvent which can disperse the fine particles of silicon oxide is vaporized.
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33. A process for producing an article coated with a functional coating film according to Claim 30, which comprises adding at least one of metal compounds and water glass to the fluid containing the fine particles of silicon oxide, coating the surface of the base material with the obtained
25 fluid containing the fine particles of silicon oxide, air drying the fluid coating the surface of the base material at an ordinary temperature, and

baking an obtained film at 150 to 650°C.

34. A process for producing an article coated with a functional coating film according to Claim 30, wherein the primer layer is coated with the fluid for forming the functional layer without mechanically touching the primer layer.
35. A process for producing an article coated with a functional coating film which comprises a base material, a primer layer which coats a surface of the base material and has fine roughness and a functional layer coating the primer layer, the process comprising steps of coating the surface of the base material with a fluid containing the fine particles of silicon oxide and a functional material, and forming the primer layer having fine roughness by unevenly accumulating the fine particles of silicon oxide on the surface of the base material and the functional layer on the formed primer layer.
36. A process for producing an article coated with a functional coating film according to Claim 35, wherein, after the surface of the base material is coated with the fluid containing the fine particles of silicon oxide and a functional material, the fluid coating the surface of the base material is air dried at an ordinary temperature.
37. A process for producing an article coated with a functional coating film according to Claim 35, which comprises adding at least one of metal compounds and water glass to the fluid containing the fine particles of

silicon oxide and a functional material, coating the surface of the base material with the obtained fluid containing the fine particles of silicon oxide and a functional material, air drying the fluid coating the surface of the base material at an ordinary temperature, and baking an obtained
5 film at 150 to 350°C.